

Panel on Future Satellite Operations

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NASA Goddard Space Flight Center's Participation in Joint SatOPS Compatibility Efforts

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Introduction



- ◆ Many U.S. government organizations build or fly space systems:
 - ❖ NASA, NOAA, Navy, Air Force, NRO, ORS. Others?
 - ❖ Through the Joint SatOps Compatibility Committee (JSCC) and our “Compatible Sat C2” efforts we have increased the grass-roots interaction between many of these organizations

- ◆ We all deal with many of the same challenges
 - ❖ More rapid deployments, lower budgets
 - ❖ Advancing technologies – frameworks, clouds, virtualization
 - ❖ Evolving concepts – automation, situational awareness, enterprise mngt.
 - ❖ Standardization – formal or by common use

- ◆ “There is an inherently governmental role in creating the business case for contractors and commercial product vendors to move in directions beneficial to multiple government space organizations.”

Mission Operations System Themes



◆ Out

- ❖ “one-off “ solutions
- ❖ 100% homegrown
- ❖ One size fits all
- ❖ Each mission on its own

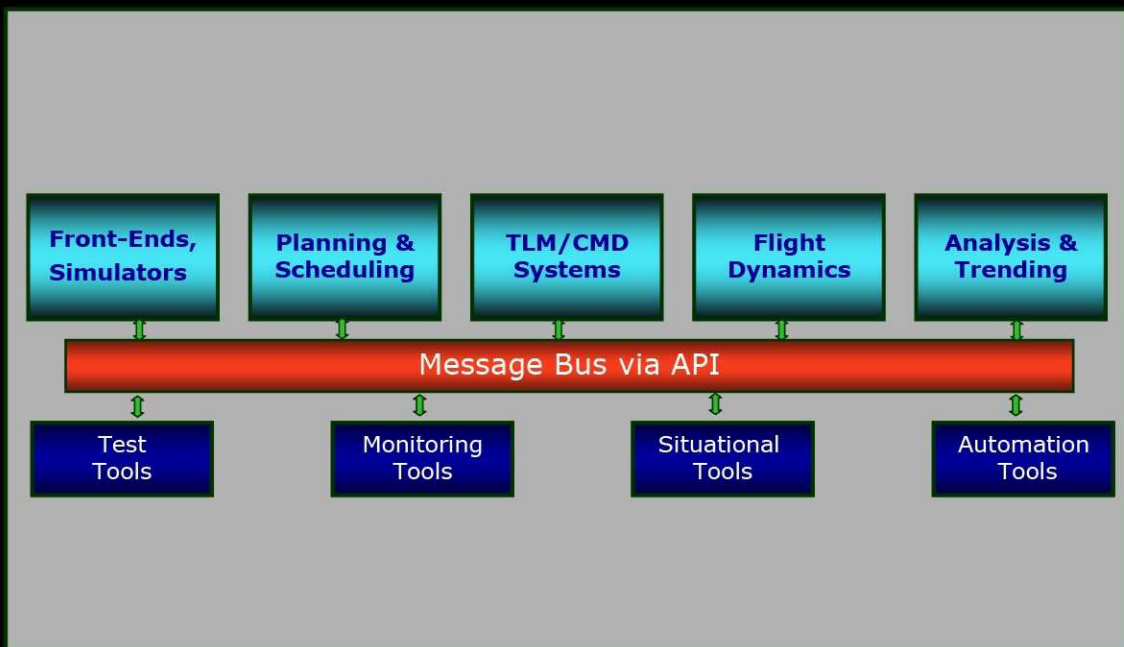
◆ In

- ❖ Increased use of commercial products
- ❖ Frameworks to simplify integration
- ❖ User choices and standards
- ❖ Common/compatible interfaces
- ❖ Software component reuse
- ❖ Collaboration across NASA and beyond
- ❖ Move towards a mission operations enterprise
- ❖ Increased automation and situational awareness

NASA/GSFC's "GMSEC" Architecture



MSFC



Avtec Systems



DesignAMERICA



The Goddard Mission Systems Evolution Center (GMSEC) provides a publish/subscribe framework to enable rapid integration of commercially available satellite control products.



NASA/GSFC's Compatible C2 Efforts (1 of 2)

- ◆ Regular interaction across the different government organizations
 - ❖ Active development support in collaboration with both the ORS and AF
 - ❖ Regularly host different external organizations' visits
 - ❖ A cross-agency network of ground system experts has been formed

- ◆ Continued development of the GMSEC framework
 - ❖ Proof of concept labs running at other JSCC locations
 - ❖ NASA continues to fund basic system development and maintenance
 - ✦ Introduced IBM's Websphere as a pub/sub communications bus
 - ✦ Adding local environmental monitoring (temp/humidity, etc.)
 - ❖ Collaborations started for GMSEC core enhancements
 - ✦ Enterprise communications
 - ✦ Security / Information Assurance
 - ✦ NDDS as a pub/sub communications bus

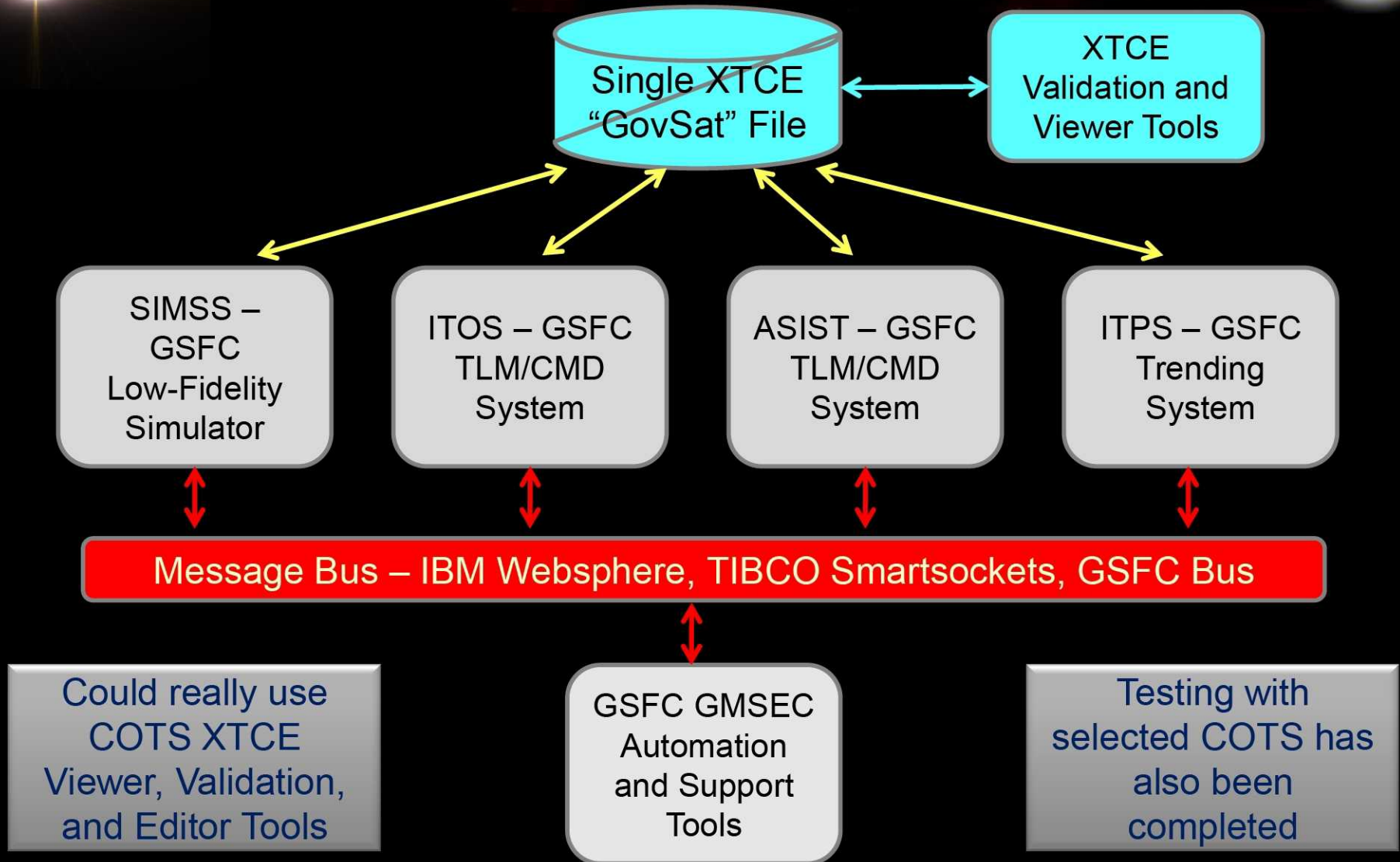
NASA/GSFC's Compatible C2 Efforts (2 of 2)



- ◆ Pushed for the adoption of XTCE for TLM/CMD list definitions
 - ❖ Developed “GovSat” – a tailored XTCE subset for CCSDS missions
 - ✦ Documented limited set of XTCE-compliant capabilities and approaches
 - ✦ Added field constraints
 - ❖ Modified GSFC-internal products to utilize XTCE definitions
 - ❖ Encouraged use of XTCE for upcoming missions
 - ✦ Missions at several NASA Centers now considering XTCE
 - ✦ ORS and Naval Research Labs have now tested with XTCE

- ◆ NASA promotes the expanded use of existing CCSDS standards
 - ❖ Packetized telemetry and command data
 - ❖ XTCE
 - ❖ Consideration of evolving Spacecraft Monitor and Control standard

NASA/GSFC XTCE “GovSat” Validation Test



Now What?



- ◆ We believe in the value of the JSCC
 - ❖ Let's keep it going as a broad forum

- ◆ Let's focus on common challenges
 - ❖ Enterprise level situational awareness
 - ❖ Security
 - ❖ Increased use of inter-agency sharing and COTS
 - ❖ Industry participation and consistency

- ◆ Continue to emphasize benefits of standards
 - ❖ CCSDS packetized data
 - ❖ XTCE
 - ❖ Delay/Disruption Tolerant Networking (DTN)